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American Woods September 1945

Aspen

Forest Service

U. S. DEPARTMENT OF AGRICULTURE

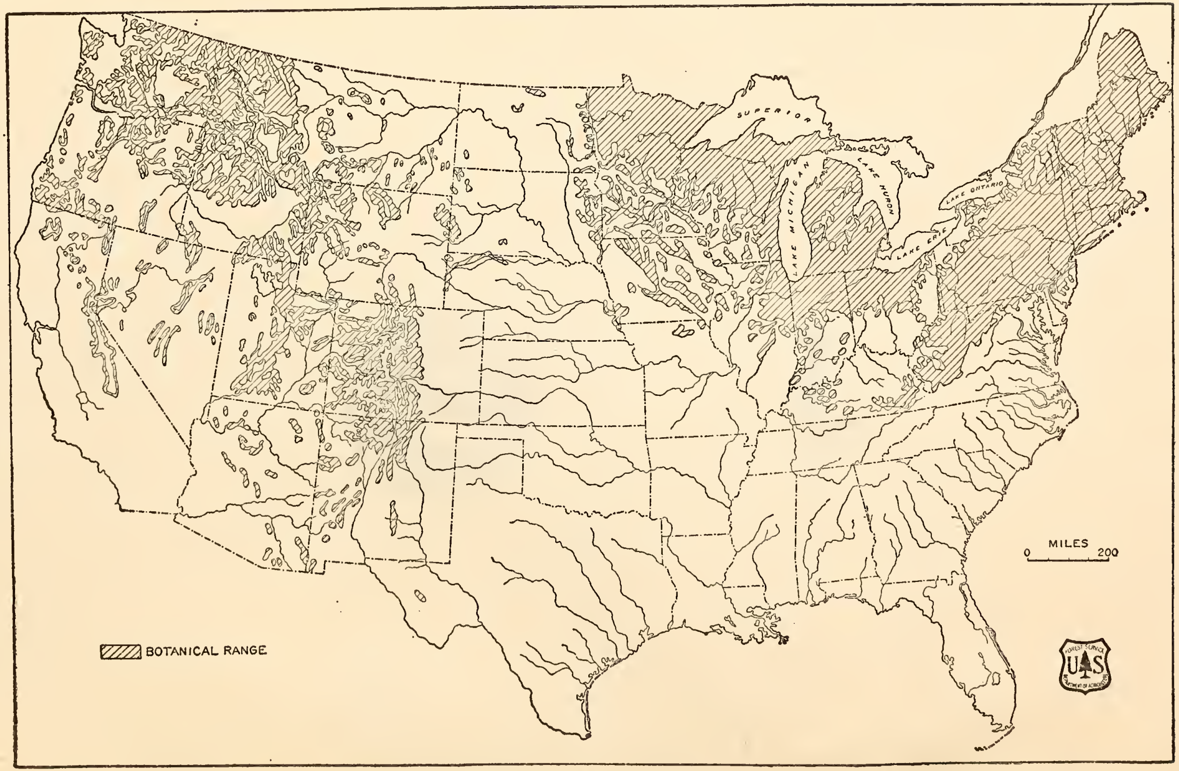

FIGURE 1.—Range of quaking aspen (*Populus tremuloides* including western var. *aurea*) in the United States.

ASPEN

(*Populus species*)

By H. S. Betts, *senior engineer, Division of Forest Products*

The name aspen in the United States is commonly applied to the wood of two closely related species of trees—quaking aspen (*Populus tremuloides*)[1] and bigtooth aspen (*Populus grandidentata*).

Quaking aspen is the most widely distributed species in North America. It is a small tree with a conspicuous whitish, smooth bark, straight trunk, and leaves with such long, slender leaf stalks that the least wind causes the foliage to turn and tremble. Quaking aspen trees are fast growing but short-lived and highly susceptible to decay. They must have sunlight to live and are often suppressed and killed by slower-growing but longer-lived species. The tree reproduces both by seed and by root sprouts.

Bigtooth aspen is also a small tree, closely resembling quaking aspen in appearance, but, as its name implies, the leaves are much more coarsely toothed. The range of bigtooth aspen is limited largely to northeastern United States, where it grows in approximately the same regions as quaking aspen except that it extends somewhat farther south.

The wood of both aspens is light colored, soft, and uniform in texture and quite similar in appearance and properties. No distinction is made in cutting and marketing the two species in regions where both occur. Aspen is used principally for paper pulp and to a less extent for boxes, crates, excelsior, and matches.

Nomenclature.—Following are the names of the aspens of commercial importance.

Common name	Botanical name	Other names
Quaking aspen	*Populus tremuloides*	Aspen. Popple. Poplar. Trembling poplar. White poplar. Golden aspen (west). Mountain aspen (west).
Bigtooth aspen	*Populus grandidentata*	Aspen. Poplar Popple. White poplar.

Distribution and growth.—Quaking aspen grows throughout most of the northeastern and western portions of the United States and in large portions of Canada and Alaska. In the eastern part of the United States its range extends from Maine southward to Tennessee

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[1] For the purposes of this leaflet quaking aspen will be considered as including its western variety, *P. tremuloides aurea*, sometimes known as golden aspen.

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and westward to the Dakotas. It is found throughout the western part of the United States except in the extreme southwest (fig. 1).

The tree generally grows to a height of 30 to 40 feet and a diameter of 8 to 12 inches. Trees in favorable situations are larger, and exceptional specimens reach a height of 90 feet and diameter of 3 feet. The trunks are frequently straight and unbranched and of practically uniform diameter for one-half or more of their length.

Aspen is very intolerant of shade and easily crowded out by competing species. In the eastern part of the United States it has an abundant crop of seed which is widely distributed by the wind and springs up quickly on burned-over areas and old fields. Aspen has an enormous sprouting capacity. In the East, cut-over areas are quickly stocked either by reproduction from seed or by root sprouts. In the West, reproduction is almost entirely by root sprouts. The typical root system of the western variety has numerous shallow roots which send up sprouts where the roots rise close to the surface.

Aspen grows from low to very high elevations and under a variety of climatic conditions. The average life of trees grown under favorable conditions is probably between 70 and 80 years. Trees not more than 40 years old frequently contain some heart rot. At 50 years of age about 10 percent of the merchantable volume of the tree contains rot in the intermediate or final stages, and at 70 years about 20 percent of the merchantable volume is so affected. Under favorable conditions aspen grows quite rapidly, reaching an average diameter of 2.7 inches and height of 21 feet in 10 years, and an average diameter of 10.4 inches and height of 66 feet in 50 years.[2] Under unfavorable conditions this growth may be reduced by one-half.

Bigtooth aspen has a comparatively limited range confined to the southeastern part of Canada and the northeastern part of the United States. In the United States it grows from New England westward to central Minnesota and central Iowa and southward in a narrowing range to Alabama and Georgia (fig. 2). Bigtooth aspen reaches about the same size as quaking aspen. It bears a large crop of seed, which is widely disseminated and springs up quickly on cut-over areas.

Supply.—The stands of commercial aspen saw timber are located principally in the Lake States and the Northeast, with smaller amounts in the Central Rocky Mountain Region. In the Pacific Coast States the amount of commercial aspen is almost negligible.

The combined stand of aspen, cottonwood, and balsam poplar of saw-timber size in the eastern part of the United States was placed at approximately 8,000,000,000 board feet in 1938.[3] It is probable that approximately one-third of it was aspen and nearly two-thirds of this aspen saw timber was in the Lake States and much of the remainder in the Northeast. In addition to aspen saw timber, there are large amounts of aspen cordwood. In the Lake States the combined stand of aspen, cottonwood, and balsam poplar of cordwood size was placed at approximately 30,000,000 cords in 1938.[4] A large proportion of it was aspen.

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[2] Franklin and Somerset Counties, Maine. See WEIGLE, W. G., and FROTHINGHAM, E. H. THE ASPENS: THEIR GROWTH AND MANAGEMENT. U. S. Forest Serv. Bul. 93, 35 pp., 1911.

[3] See UNITED STATES CONGRESS, JOINT COMMITTEE ON FORESTRY. FOREST LANDS OF THE UNITED STATES. 77th Cong., 1st sess., Senate Doc. 32, 44 pp. 1941.

[4] See CUNNINGHAM, R. N., and MOSER, H. C. FOREST AREAS AND TIMBER VOLUMES IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Rpt., 84 pp., illus. 1938.

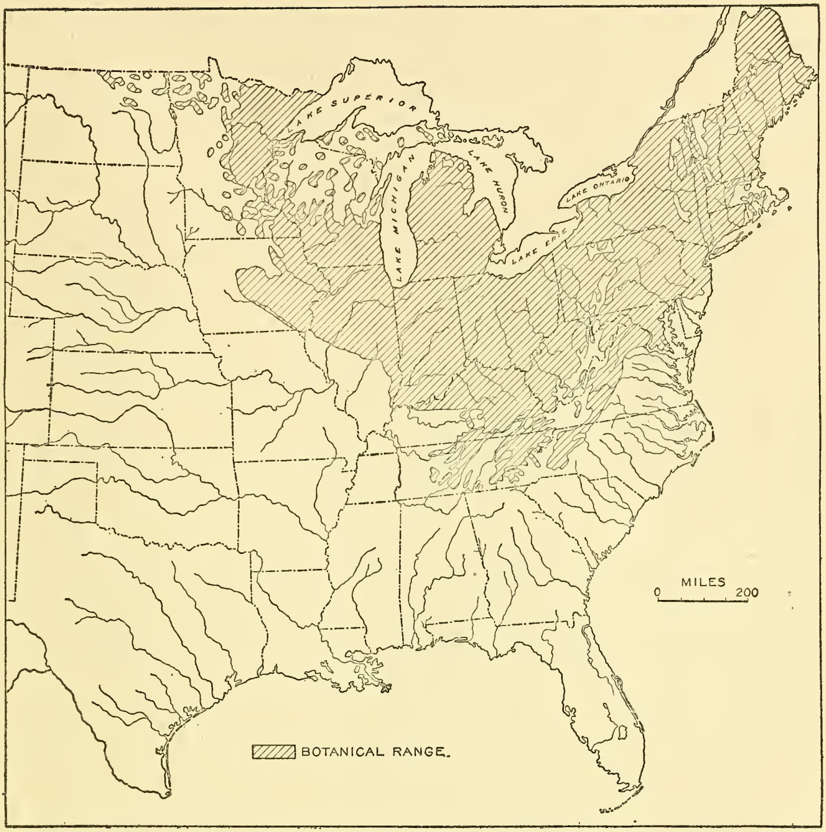

FIGURE 2.—Range of bigtooth aspen (*Populus grandidentata*) in the United States.

In the Central Rocky Mountain Region[5] estimates made in 1925[6] placed the stand of aspen at 12,658,000 cords on approximately 4,000,000 acres.[7] No saw timber was listed. Over one-half of this pulpwood stand and nearly one-half of the acreage was located in Colorado. About one-third of the stand and one-quarter of the acreage was in Utah.

In the Pacific Northwest a forest survey made in 1930[8] showed very limited quantities of commercial aspen—less than 5,000,000 board feet of saw timber and about 30,000 cords of pulpwood in Washington and Oregon.

The entire stand of aspen saw timber in the United States is estimated very roughly at 2,800,000,000 board feet. In addition to this, there are probably about 40,000,000 cords of cordwood suitable for pulpwood and fuel wood.

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[5] Includes Colorado, Idaho, Nevada, New Mexico, Utah, and Wyoming.

[6] See BAKER, F. S. ASPEN IN THE CENTRAL ROCKY MOUNTAIN REGION. U. S. Dept. Agr. Bul. 1291, 47 pp., illus. 1925.

[7] It is probable that a forest survey of this region made on the same basis as the survey of the Lake States Region would show considerable saw timber and more cordwood.

[8] Conducted by the Pacific Northwest Forest Experiment Station as part of a Forest Survey of the United States.

Production.—Both quaking aspen and bigtooth aspen are included in the lumber production statistics of the Bureau of the Census together with the cottonwoods and balsam poplar under the term "cottonwood." The annual production of "cottonwood" lumber has ranged from a maximum of 422,000,000 board feet in 1899 [9] to a minimum of 49,000,000 board feet in 1932. For the 10-year period 1933–1942 the average annual production was approximately 153,000,000 board feet. Of this amount, approximately 30,000,000 board feet came from Minnesota and was practically all aspen and balsam poplar and about 18,000,000 board feet from the other two Lake States and the Northeast and was largely aspen and balsam poplar. If an additional allowance is made for the production of aspen and balsam poplar lumber in the Central States, the combined average annual production of the two species in recent years in the eastern part of the United States may be estimated at 51,000,000 board feet, of which three-quarters, or roughly 38,000,000, was probably aspen.

The amount of aspen cut for pulpwood is considerably greater than the cut for lumber. The term "poplar" as used in pulpwood statistics [10] includes the two aspens and a small amount of balsam poplar. The consumption of "poplar" pulpwood during the period 1900–1940 has varied from a maximum of 489,866 cords in 1940 to a minimum of 180,160 cords in 1919. For the 10-year period 1931–40 the average annual consumption was 351,406 cords. Probably 95 percent of this, or 333,836 cords, equivalent to approximately 100,000,000 board feet, was aspen.[11] In 1944 the estimated aspen pulpwood consumption was 650,000 cords. It came largely from the Lake States.

Considerable aspen is also used for excelsior. Available statistics indicate a consumption of cottonwood and aspen for excelsior ranging from 55,000 cords in 1935 to 105,000 cords in 1925. The average annual consumption for the last few years [12] for which statistics are available was 77,000 cords. Probably about two-thirds of this, or roughly 50,000 cords, equivalent to 15,000,000 board feet, was aspen.[13]

The total annual cut of aspen in recent years for all purposes is estimated roughly at the equivalent of 160,000,000 board feet.

Properties.—The heartwood of the aspens is grayish white to light grayish brown. The slightly lighter colored sapwood varies in thickness and generally merges gradually into the heartwood without being clearly marked. The annual rings can be distinguished but are not conspicuous. The wood is generally straight-grained, and the texture is fine and uniform. Aspen has a characteristic disagreeable odor when moist. This odor disappears in seasoned material which does not impart odor or flavor to foodstuffs.

The wood of both of the aspens is light in weight,[14] weak, soft, moderately stiff, moderately low in resistance to shock, and has a moderately large shrinkage. It has the reputation of being difficult to season without warping. The results of some preliminary tests,[15] however, indicate that aspen can be successfully dried by modern methods. The wood can be easily glued with different glues under a wide range of gluing conditions. It ranks low in nail-holding ability[16] but has little tendency to split in nailing.

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[9] The earliest year for which statistics on "cottonwood" are available.

[10] Bureau of the Census.

[11] A cord of pulpwood is taken as equivalent to 300 board feet.

[12] Statistics available for 1923, 1925, 1927, and 1935 only.

[13] A cord of excelsior wood is taken as equivalent to 300 board feet.

[14] The average weights of quaking aspen and bigtooth aspen in an air-dry condition (12 percent moisture) are 26 pounds and 27 pounds, respectively, per cubic foot.

[15] Conducted by the Forest Products Laboratory of the Forest Service, U. S. Department of Agriculture.

Definite information is not available on the working properties of aspen with hand and power tools. Its similarity in texture and strength properties to cottonwood indicates that for satisfactory results careful attention must be paid to having the wood and tools in the proper condition. Definite information is also lacking on the painting and finishing characteristics of aspen. Such data as is available[17] indicates that it is better adapted to paint and enamel than to stain and natural finishes, and that it will at least fall in the intermediate class of woods in paint-holding ability.

The aspens can be readily made into paper pulp by the sulfite process,[18] yielding a pulp of excellent color except for numerous small specks. The pulp is easily bleached, however, and the dark specks disappear in the process. The wood reduces fairly readily by the soda process, and the resultant pulp bleaches easily. It can also be ground to pulp by the mechanical process, but requires about three times as much power as spruce and produces a pulp of lower strength.

Principal uses.—Aspen is used principally for paper pulp, lumber, excelsior, and matches. The wood is generally pulped by the soda process and the pulp used in the manufacture of book and magazine paper. The lumber goes principally into boxes and crates, including small boxes for shipping foods, for which the light color and light weight of aspen and its freedom from taste and odor make it a very satisfactory wood. For the manufacture of high-grade excelsior, aspen has long been one of the preferred woods[19] on account of its light weight and color and the toughness and resilience of the thin strands. A large proportion of aspen excelsior is made in Michigan and Wisconsin. Aspen logs in limited quantities are cut into veneer by the rotary process and used in the manufacture of matches. Comparatively small quantities of aspen lumber are used in making laundry appliances and dairy supplies.

Table 1 shows the amounts of aspen used in the manufacture of wooden products in 1933 and 1940.[20] Total figures include aspen in the form of lumber, logs and bolts, and veneer.

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[16] About the same as cottonwood and basswood.

[17] From a study under way but not yet completed at the Forest Products Laboratory of the Forest Service. U. S. Department of Agriculture.

[18] Six processes are used commercially in making paper pulp from wood. One is the mechanical or ground-wood process, in which the wood is reduced to pulp on a grindstone. The yield approaches 100 percent of the weight of the wood. Four are chemical processes—the sulfite, sulfate, soda, and neutral sulfite. They depend upon the dissolving action of chemical reagents which remove essentially all of the binding material (lignin) surrounding the cellulose fibers and leave them in a fairly pure state. The removal of the lignin is accomplished by cooking the wood chips with the proper chemical under steam pressure. The yield of pulp is about one-half the weight of the wood. In a sixth process, the semichemical, part of the lignin is removed by chemical means, and the resultant pulp, containing some lignin, is further refined by mechanical means. The yield of semichemical pulp is intermediate between the yields obtained with the mechanical process and the chemical processes.

[19] The other preferred woods for high-grade excelsior are basswood and cottonwood, especially the former.

[20] These are the only years for which this information is available for aspen as a separate wood.

Table 1.—*Aspen used in the manufacture of wooden products*

[Thousands of board feet]

Classes of products	1933	1940
Boxes, baskets, and crating	38, 079	44, 720
Dairy, poultry, and apiary supplies	861	1, 688
Furniture	43	689
Laundry appliances	1, 666	2, 485
Matches	11, 788	5, 647
Patterns and flasks		28
Refrigerators	260	
Sash, doors, general millwork	42	
Shuttles, spools, bobbins, looms		844
Sporting and athletic goods		99
Vehicles, motor		1
Woodenware and novelties	67	89
Total	[1] 52, 806	[1] 56, 290

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[1] These totals include aspen in the form of lumber, logs and bolts, and veneer in the following amounts:

	1933 *(Board feet)*	*1940* *(Board feet)*
Lumber	36, 187, 000	42, 802, 000
Logs and bolts	16, 544, 000	11, 373, 000
Veneer	75, 000	2, 115, 000

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U. S. GOVERNMENT PRINTING OFFICE: 1945

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